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IS 13873 (1993): rigid waveguide assemblies [LITD 6: Wires, Cables, Waveguides and Accessories]

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दृढ़ तरंगपथक समुच्चय – विशिष्टि

Indian Standard

RIGID WAVEGUIDE ASSEMBLIES — SPECIFICATION

UDC 621·372·82

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 3

Microwave Components and Accessories Sectional Committee, LTD 19

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Microwave Components and Accessories Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

While preparing this standard assistance has been derived from JSS 5307 : 1976 'Detail specification for waveguide assemblies, rigid', issued by the Ministry of Defence.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 AUGUST 1999
TO
IS 13873 : 1993 RIGID WAVEGUIDE ASSEMBLIES — SPECIFICATION

(*Page* 1, *clause* 2.1) — Insert the following after IS 4493 (Part 1) : 1979.

'IS 9000 (Part 1) : 1988	Basic environment testing procedures for electronic and electrical items : Part 1 General (*first revision*)'.

(*Page* 1, *clause* 4.1, *line* 2) — Substitute 'IS 10738' *for* 'IS 10733'.

(LTD 18)

Reprography Unit, BIS, New Delhi, India

Indian Standard

RIGID WAVEGUIDE ASSEMBLIES — SPECIFICATION

1 SCOPE

1.1 This standard covers the detailed requirements for the rigid waveguide assemblies.

2 REFERENCE

2.1 The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
4493 (Part 1) : 1979	Hollow metallic wave guides: Part 1 General requirements and tests (*first revision*)
9000 (Part 2/ Sec 1) : 1977	Basic environment testing procedures for electronic and electrical items : Part 2 Cold test, Section 1 General
9000 (Part 3/ Sec 1) : 1977	Basic environment testing procedures for electronic and electrical items : Part 3 Dry heat test, Section 1 General
9000 (Part 14/ Sec 1) : 1978	Basic environmental testing procedures for electronic and electrical items : Part 14 Test N : Change of temperature, Section 1 Test Na : Rapid change of temperature, (thermal shock) with prescribed time of transition — Two chamber method (*first revision*)
10673 : 1983	Sampling plans and procedures for inspection by attributes for electronic items
10738 (Part 1) : 1983	Flanges for Waveguides : Part 1 General requirements and tests

3 TERMINOLOGY

3.0 For the purpose of this standard, the terms and definitions given in IS 4493 (Part 1) : 1979 and IS 10738 (Part 1) : 1983 shall apply in addition to the following.

3.1 Style Reference

The style references used in this standard are to identify families of waveguide assemblies, Rigid. They are derived as follows:

a) The first three letters 'WAR' represent the type of component — Waveguide assembly, Rigid.

b) The fourth letter relates to basic construction of the waveguide assembly as given below:

T — Twist
B — Bend
C — Corner

c) The last letter(s) and number(s) following a hyphen indicate a particular size of the waveguide with which the waveguide assembly is to be used.

Example: WART WR 48 denotes an Assembly, Rigid, Twist designed to be used with a rectangular waveguide of style reference WR 48.

3.2 Type

Products having similar design features manufactured by the same techniques and falling within the manufacturer's standard range of ratings for these products.

NOTES

1 Mounting accessories are ignored, provided they have no significant effect on the test results.

2 Ratings cover the combination of:

a) electrical ratings,
b) sizes, and
c) climatic category.

3.3 Type Test

Tests carried out to prove conformity with requirements of this standard. These are intended to prove the general quality and design of a given rigid waveguide assembly.

3.4 Acceptance Tests

Tests carried out on samples selected from a lot for the purpose of acceptance of the lot.

3.4.1 *Lot*

All rigid waveguide assemblies of the same type, category and rating manufactured by the same factory during the same period, using the same process and materials.

3.5 Routine Tests

Tests carried out on each rigid waveguide assembly to check requirements which are likely to vary during production.

4 MATERIALS, PROCESSES AND FINISHES

4.1 Materials

Provisions of **4.1** of IS 4493 (Part 1) : 1979 and IS 10733 (Part 1) : 1983 shall apply.

4.2 Design and Construction

Waveguide assemblies, rigid shall be of the design, construction and physical dimensions specified. In cases where pins extend through the waveguide walls, they shall be soldered, welded or braced so as to allow use of the waveguide assembly in pressurized systems. Aluminium pins shall be used on aluminium step twist assemblies where aluminium brazing is used.

4.3 Finish

All aluminium-base-alloy surfaces and magnesium-base-alloy surfaces shall be chemically treated, except that interior and mating surfaces shall not be painted. All internal surfaces and mating surfaces shall be bright, smooth, dry and free of scales of oxide. External surfaces shall be painted with lustreless black enamel. Specific finishes shall be selected with respect to surfaces and base metals to be protected.

4.4 Workmanship

The waveguide assemblies shall be processed in such a manner as to be uniform in quality. All internal surfaces shall be free from burrs, die marks, chatter marks, dirt, grease, splinters, solder and other defects that will affect life of serviceability.

5 MARKING

5.1 Each waveguide assembly and its package shall be legibly and indelibly marked in the following preferred order:

a) Style reference

b) Manufacturer's code and date.

5.2 The assembly shall be marked either by decalcomania, permanent ink or paint, metal stamping, or identification plate. In case of casting, the characters may be raised or depressed. Depressed characters shall be filled with permanent white paint.

5.3 The method of marking shall not be detrimental to the performance of the waveguide assembly.

6 PACKAGING

6.1 Waveguide assembly shall be preserved and packed in a manner that will afford adequate protection against corrosion, deterioration and physical damage during transit from supply source to the first receiving activity.

6.2 The flanges of the waveguide assembly are to be sealed with push-on plastic caps to prevent damage and entrance of moisture and foreign material during storage.

7 TESTS

7.1 Conditions of Tests

7.1.1 *General*

The tests shall be carried out on the rigid waveguide assemblies as received from the manufacturer or supplier.

7.1.2 *Selection of Samples*

The samples for testing shall be so selected as to be representative of each category.

7.1.3 *Atmospheric Conditions for Testing*

7.1.3.1 Unless otherwise specified, all tests shall be caried out under standard atmospheric conditions for testing as specified in IS 9000 (Part 1) : 1988.

7.1.3.2 Before measurements are made the rigid waveguide assemblies shall be stored at the measuring temperature for a time sufficient to allow the entire rigid waveguide assemblies to reach this temperature.

7.1.3.3 When measurements are made at a temperature other than the specified temperature, the results shall, where necessary, be corrected to the specified temperature. The ambient temperature at which the measurements are made shall be stated in the test report.

7.2 Classification of Tests

7.2.1 *Type Tests*

The procedure for type approval shall be in accordance with IS 10673 : 1983.

7.2.1.1 *Number of samples*

Unless otherwise specified, the manufacturer shall submit two assemblies in each material of waveguide like copper/brass/aluminium alloy etc, and each style manufactured. One additional specimen in the form of a set of piece parts like waveguide and flange shall be submitted for the examination. Evidence shall be provided by the manufacturer that the waveguide and flanges used in the construction shall conform to the requirement of the relevant detail specification.

7.2.1.2 *Grouping of samples*

The samples shall be grouped as indicated in Table 1.

7.2.1.3 *Sequence of type tests*

The sequence of type tests shall be in accordance with Table 1.

Table 1 Schedule of Type Tests

(*Clauses* 7.2 1.2 *and* 7.2.1.3)

Group	Number of Specimens	Title of Test	Test Number (*See* Note)
0	All	General examination	1
		Angular alignment	3
		Surface roughness	4
		VSWR	5
1	1	Adhesion of paint	6
2	1	Temperature cycling	7
		Climatic	8

NOTE — For test number, please refer to Table 4.

7.2.2 *Routine Tests*

Each waveguide assembly shall be subjected to the routine tests in the order given in Table 2.

Table 2 Schedule of Routine Tests

Test Number (*See* Note 1)	Title of Test
1	Visual examination
2	Dimensions (Outline)
3	VSWR (*see* Note 2)

NOTES

1 For test number, please refer to Table 4.

2 The need of the VSWR Test may be as agreed to between the purchaser and the supplier.

7.2.3 *Acceptance Tests*

7.2.3.1 For the purpose of the acceptance of the lot, all the samples shall be subjected to the routine tests as given in **7.2.2**. Following this two groups of samples (Group A and B) shall be selected and the waveguide assemblies shall be subjected to the tests specified in Table 3 in the given order.

7.3 Electrical Tests

7.3.1 *Voltage Standing Wave Ratio* (*VSWR*)

VSWR shall be measured over the specified frequency band at all the input and output parts of the assembly on a system such as shown in Fig. 1 or a network analyser or equivalent measurement techniques. Tuners and pads shall be used where necessary to reduce residual VSWR of the system to a level which will assure accurate results before connecting the assembly under test.

7.4 Mechanical Tests

7.4.1 *Angular Alignment*

The angle between flange face and E and H plane of the internal surfaces of the waveguide shall be measured.

7.4.2 *Surface Roughness*

Provisions of **9.4.8** of IS 4493 (Part 1) : 1979 shall apply.

7.4.3 *Adhesion of Paint*

A piece of cloth shall be taped on the area under test and the cloth kept soaked overnight with tap or distilled water. Remove the wet cloth and blot up the surface water. Immediately thereafter, apply 2·5 mm strip of pressure-sensitive cellophane tape to the painted surface, adhesive side down. Press it down employing firm pressure with the hand. Remove the tape in one abrupt motion and examine the tested area for any paint damage.

There shall be no removal of paint at one of the layers of the paint system or removal of the entire system from the metal.

7.5 Climatic Tests

7.5.1 *Change of Temperature*

The waveguide assembly shall be subjected to temperature cyclic test at temperatures as specified in procedure 1 of IS 9000 (Part 14/Sec 1) : 1978 depending upon Class I, II and III as specified for individual waveguide and flanges.

The specimen shall be visually examined. There shall be no evidence of damage and mechanical deterioration. VSWR requirements as specified shall be met.

7.5.2 *Dry Heat Test*

The waveguide assembly shall be subjected to the dry heat test in accordance with IS 9000 (Part 3/Sec 1) : 1977. The temperature severity shall be the maximum of temperature specified depending upon Class I, II and III as specified for indiviual waveguide and flanges. The specimen shall be visually examined. There shall be no evidence of damage and mechanical deterioration. VSWR requirements as specified shall be met.

Table 3 Schedule of Acceptance Tests

(*Clause* 7.2.3.1)

Group	Test	AQL (Percent Defective)	Inspection Level (*See* IS 10673 : 1983)
(1)	(2)	(3)	(4)
Group 'A'	Dimensions (Detail) Angular Alignment	1	II
Group 'B'	Change of Temperature Climatic	4	S-3

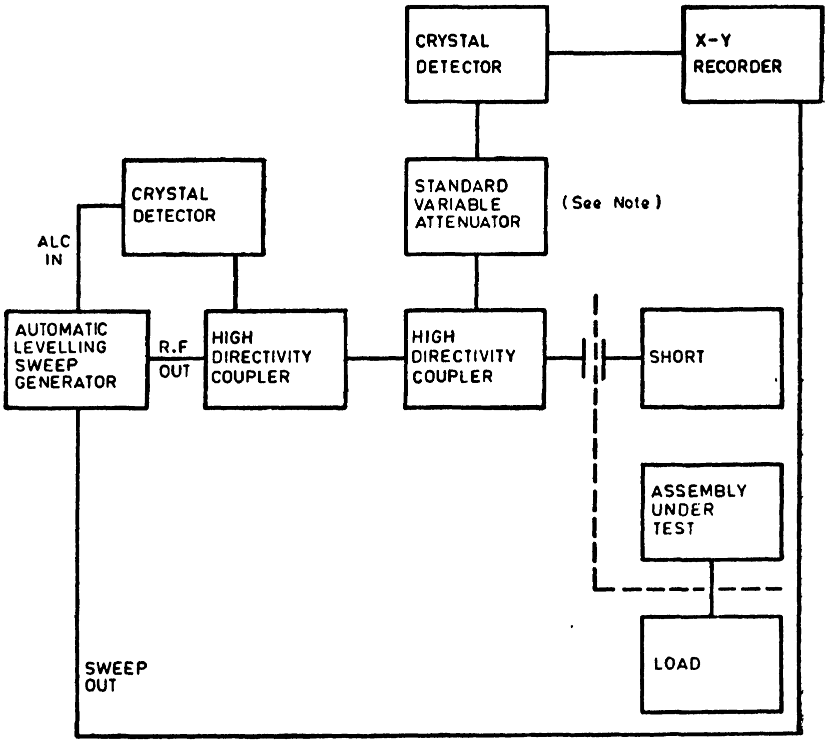
7.5.3 *Cold Test*

The waveguide assembly shall be subjected to the cold test in accordance with IS 9000 (Part 2/Sec 1) : 1977. The temperature severity shall be the minimum temperature of the temperature severity specified depending upon Class I, II and III as specified for individual waveguides and flanges. The specimen shall be visually examined. There shall be no evidence of damage and mechanical deterioration. VSWR requirements as specified shall be met.

8 GENERAL REQUIREMENTS

8.1 The characteristics, the method of measurement and the requirements to be met are given in Table 4.

8.1.1 Wherever the term 'As specified' occurs against the 'Specific Test Condition' or 'Requirements', it indicates that the details are given in the corresponding clauses of IS 4493 (Part 1) : 1979. Test conditions and requirements peculiar to the range of standards defined herein are given in the table.



NOTE — Use 20 dB pad when calibrating for coaxial end measurements, then remove.

FIG. 1 RETURN LOSS TEST SET UP

Table 4 Test Details

(*Clause* 8.1)

Test Number	Title of Test	Methods of Measurement (Ref to Clause No.)	Requirement
1.	Visual Examination	As specified	As specified
2.	Dimensions (Detail) and materials	As required	To be specified by user and manufacturer
3.	Angular alignment	7.4.1	This measured value of the angle shall not exceed 90° ± 30 minutes for the waveguide of 25·4 mm × 12·7 mm size and larger and 90° ± 15 minutes for the smaller sizes
4.	Surface Roughness	7.4.2	As specified
5.	Voltage Standing Wave Ratio (VSWR)	7.3.1	The VSWR shall be not more 1·05 : 1 over 40 percent of the usable bandwidth of the assembly
6.	Adhesion of Paint	A piece of cloth shall be taped on the area under test and the cloth kept soaked overnight with tap or distilled water. Remove the wet cloth and blot up the surface water. Immediately thereafter, apply 2·5 mm strip of pressure-sensitive cellophane tape to the painted surface, adhesive side down. Press it down employing firm pressure with the hand. Remove the tape in one abrupt motion and examine the tested area for any paint damage	There shall be no removal of paint at one of the layers of the paint system or removal of the entire system from the metal
7.	Change of temperature	7.5.1	Refer 7.5.1
	Final measurements:		
	a) Visual examination		
	b) VSWR		
8.	Climatic		
	i) Dry heat test	7.5.2	Refer 7.5.2
	Final measurements: a) Visual examination b) VSWR		
	ii) Cold test	7.5.3	Refer 7.5.3
	Final measurements: a) Visual Examination b) VSWR		

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